

What is claimed is:

- 1 1. An apparatus for removing contaminants from an article to be cleaned in a  
 2 pressure vessel comprising;  
 3 a first zone and a second zone separated by a first thermally insulated baffle,  
 4 said first zone comprising at least a first heating element adapted to  
 5 direct a fluid from said first zone to a second zone;  
 6 a third zone separated from said second zone by a second thermally insulated  
 7 baffle, said second zone comprising at least a second heating element  
 8 adapted to direct said fluid from said second zone to said third zone;  
 9 said third zone being separated from a fourth zone by a third thermally  
 10 insulated baffle, said third zone being adapted to retain said article to  
 11 be cleaned and comprising at least a third heating element adapted to  
 12 direct said fluid from said third zone to said fourth zone, said third  
 13 zone further comprising at least one cooling element and at least a first  
 14 static baffle adapted to divert at least a portion of said fluid being  
 15 directed from said fourth zone onto said article to be cleaned,  
 16 producing a natural convective fluid flow at a rate effective to remove  
 17 contaminants from said article to be cleaned.
- 1 2. The apparatus of claim 1 wherein said first zone is adapted to recover  
 2 contaminant removed from said article cleaned.
- 1 3. The apparatus of claim 1 wherein said third zone further comprises a  
 2 second static baffle adapted to direct fluid flowing from said article to be cleaned into  
 3 said second zone.

1           4.       The apparatus of claim 1 wherein said third zone is adapted to separate  
2 precipitate from said fluid.

1           5.       The apparatus of claim 2 wherein said third zone further comprises a  
2 second static baffle adapted to direct said fourth fluid flow into said second zone.

1           6.       The apparatus of claim 3 wherein said third zone further comprises a  
2 second static baffle adapted to direct said fourth fluid flow into said second zone.

1           7.       The apparatus of claim 4 wherein said third zone further comprises a  
2 second static baffle adapted to direct said fourth fluid flow into said second zone.

1           8.       The apparatus of claim 1 wherein said fluid is selected from the group  
2 consisting of a supercritical fluid and a near supercritical fluid.

1           9.       The apparatus of claim 2 wherein said fluid is selected from the group  
2 consisting of a supercritical fluid and a near supercritical fluid.

1           10.      The apparatus of claim 3 wherein said fluid is selected from the group  
2 consisting of a supercritical fluid and a near supercritical fluid.

1           11.      The apparatus of claim 4 wherein said fluid is selected from the group  
2 consisting of a supercritical fluid and a near supercritical fluid.

1           12.      The apparatus of claim 5 wherein said fluid is selected from the group  
2 consisting of a supercritical fluid and a near supercritical fluid.

1           13.      The apparatus of claim 6 wherein said fluid is selected from the group  
2 consisting of a supercritical fluid and a near supercritical fluid.

1           14.      The apparatus of claim 7 wherein said fluid is selected from the group  
2 consisting of a supercritical fluid and a near supercritical fluid.

1           15.      An apparatus for removing contaminants from an article to be cleaned  
2 in a pressure vessel comprising;

3 a first zone and a second zone separated by a first thermally insulated baffle,  
4 said second zone positioned gravitationally upward from said first  
5 zone, said first zone comprising at least a first heating element adapted  
6 to direct a fluid from said first zone to a second zone;  
7 a third zone separated from said second zone by a second thermally insulated  
8 baffle, said third zone positioned gravitationally upward from said  
9 second zone, said second zone comprising at least a second heating  
10 element adapted to direct said fluid from said second zone to said third  
11 zone;  
12 said third zone being separated from a fourth zone by a third thermally  
13 insulated baffle, said fourth zone positioned gravitationally upward  
14 from said third zone, said third zone being adapted to retain said article  
15 to be cleaned and comprising at least a third heating element adapted to  
16 direct said fluid from said third zone to said fourth zone, said third  
17 zone further comprising at least one cooling element and at least a first  
18 static baffle adapted to divert at least a portion of said fluid being  
19 directed to said fourth zone onto said article to be cleaned, producing a  
20 natural convective fluid flow at a rate effective to remove contaminants  
21 from said article to be cleaned.

1 16. The apparatus of claim 2 wherein  
2 said second zone is positioned gravitationally above said first zone;  
3 said third zone is positioned gravitationally above said second zone; and,  
4 said fourth zone is positioned gravitationally above said third zone.

1           17.     An apparatus for removing contaminants from an article to be cleaned  
2     in a pressure vessel comprising;  
3           a first zone and a second zone separated by a first thermally insulated baffle,  
4                 said second zone positioned gravitationally upward from said first  
5                 zone, said first zone comprising at least a first heating element adapted  
6                 to direct a fluid from said first zone to a second zone;  
7           a third zone separated from said second zone by a second thermally insulated  
8                 baffle, said third zone positioned gravitationally upward from said  
9                 second zone, said second zone comprising at least a second heating  
10                element adapted to direct said fluid from said second zone to said third  
11                zone;  
12           said third zone being separated from a fourth zone by a third thermally  
13                insulated baffle, said fourth zone positioned gravitationally upward  
14                from said third zone, said third zone being adapted to retain said article  
15                to be cleaned and comprising at least a third heating element adapted to  
16                direct said fluid from said third zone to said fourth zone, said third  
17                zone further comprising at least one cooling element and at least a first  
18                static baffle adapted to divert at least a portion of said fluid being  
19                directed to said fourth zone onto said article to be cleaned, producing a  
20                natural convective fluid flow at a rate effective to remove contaminants  
21                from said article to be cleaned, said third zone further comprising a  
22                second static baffle adapted to direct fluid flowing from said article to  
23                be cleaned into said second zone.

1           18.     The apparatus of claim 4 wherein

2 said second zone is positioned gravitationally above said first zone;  
3 said third zone is positioned gravitationally above said second zone; and,  
4 said fourth zone is positioned gravitationally above said third zone.

1 19. The apparatus of claim 5 wherein  
2 said second zone is positioned gravitationally above said first zone;  
3 said third zone is positioned gravitationally above said second zone; and,  
4 said fourth zone is positioned gravitationally above said third zone.

1 20. The apparatus of claim 6 wherein  
2 said second zone is positioned gravitationally above said first zone;  
3 said third zone is positioned gravitationally above said second zone; and,  
4 said fourth zone is positioned gravitationally above said third zone.

1 21. The apparatus of claim 7 wherein  
2 said second zone is positioned gravitationally above said first zone;  
3 said third zone is positioned gravitationally above said second zone; and,  
4 said fourth zone is positioned gravitationally above said third zone.

1 22. The apparatus of claim 8 wherein  
2 said second zone is positioned gravitationally above said first zone;  
3 said third zone is positioned gravitationally above said second zone; and,  
4 said fourth zone is positioned gravitationally above said third zone.

1 23. The apparatus of claim 9 wherein  
2 said second zone is positioned gravitationally above said first zone;  
3 said third zone is positioned gravitationally above said second zone; and,  
4 said fourth zone is positioned gravitationally above said third zone.

1 24. The apparatus of claim 10 wherein

2 said second zone is positioned gravitationally above said first zone;  
 3 said third zone is positioned gravitationally above said second zone; and,  
 4 said fourth zone is positioned gravitationally above said third zone.

1 25. The apparatus of claim 11 wherein  
 2 said second zone is positioned gravitationally above said first zone;  
 3 said third zone is positioned gravitationally above said second zone; and,  
 4 said fourth zone is positioned gravitationally above said third zone.

1 26. The apparatus of claim 12 wherein  
 2 said second zone is positioned gravitationally above said first zone;  
 3 said third zone is positioned gravitationally above said second zone; and,  
 4 said fourth zone is positioned gravitationally above said third zone.

1 27. The apparatus of claim 13 wherein  
 2 said second zone is positioned gravitationally above said first zone;  
 3 said third zone is positioned gravitationally above said second zone; and,  
 4 said fourth zone is positioned gravitationally above said third zone.

1 28. The apparatus of claim 14 wherein  
 2 said second zone is positioned gravitationally above said first zone;  
 3 said third zone is positioned gravitationally above said second zone; and,  
 4 said fourth zone is positioned gravitationally above said third zone.

1 29. The apparatus of claim 1 further comprising means for separating  
 2 precipitate from said fluid.

1 30. The apparatus of claim 2 further comprising means for separating  
 2 precipitate from said fluid.

1           31.    The apparatus of claim 3 further comprising means for separating  
2 precipitate from said fluid.

1           32.    The apparatus of claim 4 wherein said third zone comprises means for  
2 separating precipitate from said fluid.

1           33.    The apparatus of claim 5 further comprising means for separating  
2 precipitate from said fluid.

1           34.    The apparatus of claim 6 further comprising means for separating  
2 precipitate from said fluid.

1           35.    The apparatus of claim 7 wherein said third zone comprises means for  
2 separating precipitate from said fluid.

1           36.    The apparatus of claim 8 further comprising means for separating  
2 precipitate from said fluid.

1           37.    The apparatus of claim 14 further comprising means for separating  
2 precipitate from said fluid.

1           38.    The apparatus of claim 15 further comprising means for separating  
2 precipitate from said fluid.

1           39.    The apparatus of claim 21 further comprising means for separating  
2 precipitate from said fluid.

1           40.    The apparatus of claim 28 further comprising means for separating  
2 precipitate from said fluid.

1           41.    The apparatus of claim 1 further comprising one or more additional  
2 zones separated by additional thermal insulating baffles and comprising at least an  
3 additional heating or cooling element adapted to produce a natural convective fluid  
4 flow at a rate effective to remove contaminants from said article to be cleaned.